(d) The frame or support of each B–V fire extinguisher permitted by paragraph (c) of this section must be welded or otherwise permanently attached to a bulkhead or deck.

[CGD 85–080, 61 FR 982, Jan. 10, 1996; 61 FR 24464, May 15, 1996, as amended at 62 FR 51358, Sept. 30, 1997]

§ 181.520 Installation and location.

Portable fire extinguishers must be located so that they are clearly visible and readily accessible from the space being protected. The installation and location must be to the satisfaction of the Officer in Charge, Marine Inspection.

Subpart F—Additional Equipment

§ 181.600 Fire axe.

A vessel of more than 19.8 meters (65 feet) in length must have at least one fire axe located in or adjacent to the primary operating station.

§ 181.610 Fire bucket.

A vessel not required to have a power driven fire pump by §181.300 must have at least three 9.5 liter (2½ gallon) buckets, with an attached lanyard satisfactory to the cognizant OCMI, placed so as to be easily available during an emergency. The words ''FIRE BUCKET'' must be stenciled in a contrasting color on each bucket.

[CGD 85–080, 61 FR 982, Jan. 10, 1996, as amended at 62 FR 51358, Sept. 30, 1997]

PART 182—MACHINERY INSTALLATION

Subpart A—General Provisions

Subpart B—Propulsion Machinery

Subpart C—Auxiliary Machinery

Subpart D—Specific Machinery Requirements

Subpart E—Bilge and Ballast Systems

Subpart F—Steering Systems

Subpart G—Piping Systems

AUTHORITY: 46 U.S.C. 3306; E.O. 12234, 45 FR 58801, 3 CFR, 1980 Comp., p. 277; 49 CFR 1.46.

SOURCE: CGD 85–080, 61 FR 986, Jan. 10, 1996, unless otherwise noted.

Subpart A—General Provisions

§ 182.100 Intent.

This part contains requirements for the design, construction, installation, and operation of propulsion and auxiliary machinery, piping and pressure systems, steering apparatus, and associated safety systems. Machinery and

equipment installed on each vessel must be suitable for the vessel and its operation and for the purpose intended. All machinery and equipment must be installed and maintained in such a manner as to afford adequate protection from causing fire, explosion, machinery failure, and personnel injury.

§ 182.115 Applicability to existing vessels.

(a) Except as otherwise required by paragraphs (b), (c) and (d) of this section, an existing vessel must comply with the regulations on machinery, bilge and ballast system equipment, steering apparatus, and piping systems or components that were applicable to the vessel on March 10, 1996 or, as an alternative, the vessel may comply with the regulations in this part.

(b) New installations of machinery, bilge and ballast system equipment, steering equipment, and piping systems or components on an existing vessel, which are completed to the satisfaction of the cognizant Officer in Charge, Marine Inspection (OCMI) on or after March 11, 1996, must comply with the regulations of this part. Replacement of existing equipment installed on the vessel prior to March 11, 1996, need not comply with the regulations in this part.

(c) An existing vessel equipped with machinery powered by gasoline or other fuels having a flash point of 43.3° C (110° F) or lower must comply with the requirements of §182.410(c) on or before March 11, 1999.

(d) On or before March 11, 1999, an existing vessel must comply with the bilge high level alarm requirements in §182.530.

§ 182.130 Alternative standards.

A vessel of not more than 19.8 meters (65 feet) in length carrying not more than 12 passengers propelled by gasoline or diesel internal combustion engines, other than a High Speed Craft, may comply with the following American Boat and Yacht Council (ABYC) Projects or 33 CFR subchapter S (Boating Safety), where indicated in this part, in lieu of complying with those requirements:

(a) H–2—''Ventilation of Boats Using Gasoline'', or 33 CFR 183, subpart K, ''Ventilation'';

(b) H–22—''DC Electric Bilge Pumps Operating Under 50 Volts'';

(c) H–24—''Gasoline Fuel Systems'', or 33 CFR 183, subpart J—''Fuel System'';

(d) H–25—''Portable Gasoline Fuel Systems for Flammable Liquids'';

(e) H–32—''Ventilation of Boats Using Diesel Fuel'';

(f) H–33—''Diesel Fuel Systems'';

(g) P–1—''Installation of Exhaust Systems for Propulsion and Auxiliary Engines''; and

(h) P–4—''Marine Inboard Engines''.

Subpart B—Propulsion Machinery

§ 182.200 General.

(a) Propulsion machinery must be suitable in type and design for propulsion requirements of the hull in which it is installed and capable of operating at constant marine load under such requirements without exceeding its designed limitations.

(b) All engines must have at least two means for stopping the engine(s) under any operating conditions. The fuel oil shutoff required at the engine by §182.455(b)(4) will satisfy one means of stopping the engine.

§ 182.220 Installations.

(a) Except as otherwise provided in this section, propulsion machinery installations must comply with the provisions of this part.

(b) The requirements for machinery and boilers for steam and electrically propelled vessels are contained in applicable regulations in subchapter F (Marine Engineering) and subchapter J (Electrical Engineering) of this chapter.

(c) Propulsion machinery of an unusual type for small passenger vessels must be given separate consideration and is subject to such requirements as determined necessary by the cognizant OCMI. These unusual types of propulsion machinery include:

(1) Gas turbine machinery installations;

(2) Air screws;

(3) Hydraulic jets; and

(4) Machinery installations using lift devices.

Subpart C—Auxiliary Machinery

§ 182.310 Installations.

(a) Auxiliary machinery of the internal combustion piston type must comply with the provisions of this part.

(b) Auxiliary machinery of the steam or gas turbine type will be given separate consideration and must meet the applicable requirements of subchapter F (Marine Engineering) of this chapter as determined necessary by the cognizant OCMI.

(c) Auxiliary boilers and heating boilers and their associated piping and fittings will be given separate consideration and must meet the applicable requirements of subchapter F (Marine Engineering) of this chapter as determined necessary by the cognizant OCMI, except that heating boilers must be tested or examined every three years.

§ 182.320 Water heaters.

(a) A water heater must meet the requirements of parts 53 and 63 of this chapter if rated at not more than 689 kPa (100 psig) and 121° C (250° F), except that an electric water heater is also acceptable if it:

(1) Has a capacity of not more than 454 liters (120 gallons);

(2) Has a heat input of not more than 58.6 kilowatts (200,000 Btu per hour);

(3) Is listed by Underwriters Laboratories (UL) under UL 174, ''Household Electric Storage Tank Water Heaters,'' UL 1453, ''Electric Booster and Commercial Storage Tank Water Heaters,'' or other standard specified by the Commandant; and

(4) Is protected by a pressure-temperature relief device.

(b) A water heater must meet the requirements of parts 52 and 63 of this chapter if rated at more than 689 kPa (100 psig) or 121° C (250° F).

(c) A water heater must be installed and secured from rolling by straps or other devices to the satisfaction of the cognizant OCMI.

[CGD 85–080, 61 FR 986, Jan. 10, 1996; 61 FR 20557, May 7, 1996, as amended at 62 FR 51358, Sept. 30, 1997]

§ 182.330 Pressure vessels.

All unfired pressure vessels must be installed to the satisfaction of the cognizant OCMI. The design, construction, and original testing of such unfired pressure vessels must meet the applicable requirements of subchapter F (Marine Engineering) of this chapter.

Subpart D—Specific Machinery Requirements

§ 182.400 Applicability.

(a) This subpart applies to all propulsion and auxiliary machinery installations of the internal combustion piston type.

(b) Requirements of this subpart that are only applicable to engines that use gasoline or other fuels having a flashpoint of 43.3° C (110° F) or lower are specifically designated in each section.

(c) Requirements of this subpart that are only applicable to engines that use diesel fuel or other fuels having a flashpoint of more than 43.3° C (110° F) are specifically designated in each section.

(d) Where no specific gasoline, diesel, or other fuel designation exists, the requirements of this subpart are applicable to all types of fuels and machinery.

§ 182.405 Fuel restrictions.

The use of alternative fuels, other than diesel fuel or gasoline, as fuel for an internal combustion engine will be reviewed on a case-by-case basis by the Commandant.

[CGD 85–080, 61 FR 986, Jan. 10, 1996, as amended by CGD 97–057, 62 FR 51050, Sept. 30, 1997]

§ 182.410 General requirements.

(a) Starting motors, generators, and any spark producing device must be mounted as high above the bilges as practicable. Electrical equipment in spaces, compartments, or enclosures that contain machinery powered by, or fuel tanks for, gasoline or other fuels having a flashpoint of 43.3° C (110° F) or lower must be explosion-proof, intrinsically safe, or ignition protected for use in a gasoline atmosphere as required by § 183.530 of this chapter.

(b) Gauges to indicate engine revolutions per minute (RPM), jacket water discharge temperature, and lubricating oil pressure must be provided for all propulsion engines installed in the vessel. The gauges must be readily visible at the operating station.

(c) An enclosed space containing machinery powered by gasoline or other fuels having a flash point of 43.3° C (110° F) or lower must be equipped with a flammable vapor detection device in compliance with §182.480.

(d) In systems and applications where flexible hoses are permitted to be clamped:

(1) Double hose clamping is required where practicable;

(2) The clamps must be of a corrosion resistant metallic material;

(3) The clamps must not depend on spring tension for their holding power; and

(4) Two clamps must be used on each end of the hose, or one hose clamp can be used if the pipe ends are expanded or beaded to provide a positive stop against hose slippage.

§182.415 Carburetors.

(a) All carburetors except the downdraft type must be equipped with integral or externally fitted drip collectors of adequate capacity and arranged so as to permit ready removal of fuel leakage. Externally fitted drip collectors, must be covered with flame screens. Drip collectors, where practicable, should automatically drain back to engine air intakes.

(b) All gasoline engines installed in a vessel, except outboard engines, must be equipped with an acceptable means of backfire flame control. Installation of backfire flame arresters bearing basic Approval Numbers 162.015 or 162.041 or engine air and fuel induction systems bearing basic Approval Numbers 162.042 or 162.043 may be continued in use as long as they are serviceable and in good condition. New installations or replacements must meet the applicable requirements of this section.

(c) The following are acceptable means of backfire flame control for gasoline engines:

(1) A backfire flame arrester complying with Society of Automotive Engineers (SAE) J–1928, ''Devices Providing Backfire Flame Control for Gasoline Engines in Marine Applications,'' or UL 1111, ''Marine Carburetor Flame Arrestors,'' and marked accordingly. The flame arrester must be suitably secured to the air intake with a flametight connection.

(2) An engine air and fuel induction system that provides adequate protection from propagation of backfire flame to the atmosphere equivalent to that provided by an acceptable backfire flame arrester. A gasoline engine utilizing an air and fuel induction system, and operated without an approved backfire flame arrester, must either include a reed valve assembly or be installed in accordance with SAE J–1928, or other standard specified by the Commandant.

(3) An arrangement of the carburetor or engine air induction system that will disperse any flames caused by engine backfire. The flames must be dispersed to the atmosphere outside the vessel in such a manner that the flames will not endanger the vessel, persons on board, or nearby vessels and structures. Flame dispersion may be achieved by attachments to the carburetor or location of the engine air induction system. All attachments must be of metallic construction with flametight connections and firmly secured to withstand vibration, shock, and engine backfire. Such installations do not require formal approval and labeling but must comply with this subpart.

(4) An engine air induction system on a vessel with an integrated engine-vessel design must be approved, marked, and tested under §162.043 in subchapter Q of this chapter, or other standard specified by the Commandant.

§182.420 Engine cooling.

(a) Except as otherwise provided in paragraphs (b), (c), (d), and (e) of this section, all engines must be water cooled and meet the requirements of this paragraph.

(1) The engine head, block, and exhaust manifold must be water-jacketed and cooled by water from a pump that operates whenever the engine is operating.

(2) A suitable hull strainer must be installed in the circulating raw water

intake line of an engine cooling water system.

(3) A closed fresh water system may be used to cool the engine.

(b) An engine water cooling system on a vessel of not more than 19.8 meters (65 feet) in length carrying not more than 12 passengers, may comply with the requirements of ABYC Project P–4, ''Marine Inboard Engines,'' instead of the requirements of paragraph (a) of this section.

(c) On a vessel of not more than 19.8 meters (65 feet) in length carrying not more than 12 passengers, a propulsion gasoline engine may be air cooled when in compliance with the requirements of ABYC Project P–4.

(d) An auxiliary gasoline engine may be air cooled when:

(1) It has a self-contained fuel system and it is installed on an open deck; or

(2) On a vessel of not more than 19.8 meters (65 feet) in length carrying not more than 12 passengers, it is in compliance with the requirements of ABYC P–4.

(e) A propulsion or auxiliary diesel engine may be air cooled or employ an air cooled jacket water radiator when:

(1) Installed on an open deck and sufficient ventilation for machinery cooling is available;

(2) Installed in an enclosed or partially enclosed space for which ventilation for machinery cooling is provided, which complies with the requirement of § 182.465(b), and other necessary safeguards are taken so as not to endanger the vessel; or

(3) Installed on a vessel of not more than 19.8 meters (65 feet) in length carrying not more than 12 passengers, in compliance with the requirements of ABYC Project P–4.

§ 182.422 Integral and non-integral keel cooler installations.

(a) A keel cooler installation used for engine cooling must be designed to prevent flooding.

(b) Except as provided in paragraph (e), a shutoff valve must be located where the cooler piping penetrates the shell, as near the shell as practicable, except where the penetration is forward of the collision bulkhead.

(c) The thickness of the inlet and discharge connections, outboard of the shutoff valves required by paragraph (b) of this section, must be at least Schedule 80.

(d) Short lengths of approved nonmetallic flexible hose, fixed by two hose clamps at each end of the hose, may be used at machinery connections for a keel cooler installation.

(e) Shutoff valves are not required for integral keel coolers. A keel cooler is considered integral to the hull if the following conditions are satisfied:

(1) The cooler structure is fabricated from material of the same thickness and quality as the hull;

(2) The flexible connections are located well above the deepest subdivision draft;

(3) The end of the structure is faired to the hull with a slope no greater than 4 to 1; and

(4) Full penetration welds are employed in the fabrication of the structure and its attachment to the hull.

[CGD 85–080, 61 FR 986, Jan. 10, 1996, as amended by USCG–2000–7790, 65 FR 58465, Sept. 29, 2000]

§ 182.425 Engine exhaust cooling.

(a) Except as otherwise provided in this paragraph, all engine exhaust pipes must be water cooled.

(1) Vertical dry exhaust pipes are permissible if installed in compliance with §§ 177.405(b) and 177.970 of this chapter.

(2) Horizontal dry exhaust pipes are permitted only if:

(i) They do not pass through living or berthing spaces;

(ii) They terminate above the deepest load waterline;

(iii) They are so arranged as to prevent entry of cold water from rough or boarding seas;

(iv) They are constructed of corrosion resisting material at the hull penetration; and

(v) They are installed in compliance with §§ 177.405(b) and 177.970 of this chapter.

(b) The exhaust pipe cooling water system must comply with the requirements of this paragraph.

(1) Water for cooling the exhaust pipe must be obtained from the engine cooling water system or a separate engine driven pump.

(2) Water for cooling the exhaust pipe, other than a vertical exhaust,

must be injected into the exhaust system as near to the engine manifold as practicable. The water must pass through the entire length of the exhaust pipe.

(3) The part of the exhaust system between the point of cooling water injection and the engine manifold must be water-jacketed or effectively insulated and protected in compliance with §§ 177.405(b) and 177.970 of this chapter.

(4) Vertical exhaust pipes must be water-jacketed or suitably insulated as required by § 182.430(g).

(5) When the exhaust cooling water system is separate from the engine cooling water system, a suitable warning device, visual or audible, must be installed at the operating station to indicate any reduction in normal water flow in the exhaust cooling system.

(6) A suitable hull strainer must be installed in the circulating raw water intake line for the exhaust cooling system.

(c) Engine exhaust cooling system built in accordance with the requirements of ABYC Project P–1, ''Installation of Exhaust Systems for Propulsion and Auxiliary Machinery,'' will be considered as meeting the requirements of this section.

[CGD 85–080, 61 FR 986, Jan. 10, 1996; 61 FR 20557, May 7, 1996]

§ 182.430 Engine exhaust pipe installation.

(a) The design of all exhaust systems must ensure minimum risk of injury to personnel. Protection must be provided in compliance with § 177.970 of this chapter at such locations where persons or equipment might come in contact with an exhaust pipe.

(b) Exhaust gas must not leak from the piping or any connections. The piping must be properly supported by noncombustible hangers or blocks.

(c) The exhaust piping must be so arranged as to prevent backflow of water from reaching engine exhaust ports under normal conditions.

(d) Pipes used for wet exhaust lines must be Schedule 80 or corrosion-resistant material and adequately protected from mechanical damage.

(e) Where flexibility is necessary, a section of flexible metallic hose may be used. Nonmetallic hose may be used for wet exhaust systems provided it is especially adapted to resist the action of oil, acid, and heat, has a wall thickness sufficient to prevent collapsing or panting, and is double clamped where practicable.

(f) Where an exhaust pipe passes through a watertight bulkhead, the watertight integrity of the bulkhead must be maintained. Noncombustible packing must be used in bulkhead penetration glands for dry exhaust systems. A wet exhaust pipe may be welded to a steel or equivalent bulkhead in way of a penetration and a fiberglass wet exhaust pipe may be fiberglassed to a fiberglass reinforced plastic bulkhead if suitable arrangements are provided to relieve the stresses resulting from the expansion of the exhaust piping.

(g) A dry exhaust pipe must:

(1) If it passes through a combustible bulkhead or partition, be kept clear of, and suitably insulated or shielded from, combustible material.

(2) Be provided with noncombustible hangers and blocks for support.

(h) An exhaust pipe discharge terminating in a transom must be located as far outboard as practicable so that exhaust gases cannot reenter the vessel.

(i) Arrangements must be made to provide access to allow complete inspection of the exhaust piping throughout its length.

(j) An exhaust installation subject to pressures in excess of 105 kPa (15 psig) gauge or having exhaust pipes passing through living or working spaces must meet the material requirements of part 56 of subchapter F (Marine Engineering) of this chapter.

(k) Engine exhaust installations built in accordance with the requirements of ABYC Project P–1, will be considered as meeting the requirements of this section.

[CGD 85–080, 61 FR 986, Jan. 10, 1996; 61 FR 20557, May 7, 1996; 61 FR 24464, May 15, 1996, as amended at 62 FR 51358, Sept. 30, 1997]

§ 182.435 Integral fuel tanks.

(a) Gasoline fuel tanks must be independent of the hull.

(b) Diesel fuel tanks may not be built integral with the hull of a vessel unless the hull is made of:

(1) Steel;

(2) Aluminum; or

(3) Fiber reinforced plastic when:

(i) Sandwich construction is not used; or

(ii) Sandwich construction is used with only a core material of closed cell polyvinyl chloride or equivalent.

(c) During the initial inspection for certification of a vessel, integral fuel tanks must withstand a hydrostatic pressure test of 35 kPa (5 psig), or the maximum pressure head to which they may be subjected in service, whichever is greater. A standpipe of 3.5 meters (11.5 feet) in height attached to the tank may be filled with water to accomplish the 35 kPa (5 psig) test.

[CGD 85–080, 61 FR 986, Jan. 10, 1996, as amended at 62 FR 51358, Sept. 30, 1997]

§ 182.440 Independent fuel tanks.

(a) *Materials and construction.* Independent fuel tanks must be designed and constructed of materials in compliance with the requirements of this paragraph.

(1) The material used and the minimum thickness allowed must be as indicated in Table 182.440(a)(1), except that other materials that provide equivalent safety may be approved for use under paragraph (a)(3) of this section. Tanks having a capacity of more than 570 liters (150 gallons) must be designed to withstand the maximum head to which they may be subjected in service, but in no case may the thickness be less than that specified in Table 182.440(a)(1).

TABLE 182.440(a)(1)

Material	ASTM specification (latest edition) [see also § 175.600 of this chapter]	Thickness in millimeters (inches) and [gage number][1] vs. tank capacities for:		
		4 to 300 liter (1 to 80 gal) tanks	More than 300 liter (80 gal) and not more than 570 liter (150 gal) tanks	Over 570 liter (150 gal)[2] tanks
Nickel-cooper	B127, hot rolled sheet or plate	0.94 (0.037) [USSG 20][3]	1.27 (0.050) [USSG 18]	2.72 (0.107) [USSG 12]
Copper-nickel[4]	B122, UNS alloy C71500	1.14 (0.045) [AWG 17]	1.45 (0.057) [AWG 15]	3.25 (0.128) [AWG 8]
Copper[4]	B152, UNS alloy C11000	1.45 (0.057) [AWG 15]	2.06 (0.081) [AWG 12]	4.62 (0.182) [AWG 5]
Copper-silicon[4]	B 96, alloys C65100 and C65500	1.29 (0.051) [AWG 16]	1.63 (0.064) [AWG 14]	3.66 (0.144) [AWG 7]
Steel or iron[5,6]	* * * * *	1.90 (0.0747) [MSG 14]	2.66 (0.1046) [MSG 12]	4.55 (0.1793) [MSG 7]
Aluminum[7]	B209, alloy 5052, 5083, 5086	6.35 (0.250) [USSG 3]	6.35 (0.250) [USSG 3]	6.35 (0.250) [USSG 3]
Fiber reinforced plastic	* * * * *	As required[8]	As required[8]	As required[8]

[1] The gage numbers used in this table may be found in many standard engineering reference books. The letters ''USSG'' stand for ''U.S. Standard Gage,'' which was established by the act of March 3, 1892 (15 U.S.C. 206), for sheet and plate iron and steel. The letters ''AWG'' stand for ''American Wire Gage'' (or Brown and Sharpe Gage) for nonferrous sheet thicknesses. The letters ''MSG'' stand for ''Manufacturers' Standard Gage'' for sheet steel thickness.

[2] Tanks over 1514 liters (400 gallons) shall be designed with a factor of safety of four on the ultimate strength of the material used with a design head of not less than 1220 millimeters (4 feet) of liquid above the top of the tank.

[3] Nickel-copper not less than 0.79 millimeter (0.031 inch) [USSG 22] may be used for tanks up to 114-liter (30-gallon) capacity.

[4] Acceptable only for gasoline service.

[5] Gasoline fuel tanks constructed of iron or steel, which are less than 5 millimeter (0.1875) inch) thick, shall be galvanized inside and outside by the hot dip process. Tanks intended for use with diesel oil shall not be internally galvanized.

[6] Stainless steel tanks are not included in this category.

[7] Anodic to most common metals. Avoid dissimilar metal contact with tank body.

[8] The requirements of § 182.440(a)(2) apply.

(2) Fiber reinforced plastic may be used for diesel fuel tanks under the following provisions:

(i) The materials must be fire retardant. Flammability of the material must be determined by the standard test methods in America Society for Testing and Materials (ASTM) D635, ''Rate of Burning and/or Extent and Time of Burning of Self-supporting Plastics in a Horizontal Position,'' and ASTM D2863, ''Measuring the Minimum Oxygen Concentration to Support Candle-like Combustion of Plastics (Oxygen Index),'' or other standard specified by the Commandant. The results of these tests must show that the average extent of burning is less than 10 millimeters (0.394 inches), the average time of burning is less than 50 seconds, and the limiting oxygen index is greater than 21.

(ii) Tanks must meet UL 1102, ''Non integral Marine Fuel Tanks,'' or other standard specified by the Commandant. Testing may be accomplished by an independent laboratory or by the fabricator to the satisfaction of the OCMI.

(iii) Tanks must be designed to withstand the maximum heat to which they may be subjected to in service.

(iv) Installation of nozzles, flanges or other fittings for pipe connections to the tanks must be acceptable to the cognizant OCMI.

(v) Baffle plates, if installed, must be of the same material and not less than the minimum thickness of the tank walls. Limber holes at the bottom and air holes at the top of all baffles must be provided. Baffle plates must be installed at the time the tests required by UL Standard 1102, or other standard specified by the Commandant, are conducted.

(3) Materials other than those listed in Table 182.440(a)(1) must be approved by the Commandant. An independent tank using material approved by the Commandant under this paragraph must meet the testing requirements of UL Standard 1102, or other standard specified by the Commandant. Testing may be accomplished by an independent laboratory or by the fabricator to the satisfaction of the OCMI.

(4) Tanks with flanged-up top edges that may trap and hold moisture are prohibited.

(5) Openings for fill pipes, vent pipes, and machinery fuel supply pipes, and openings for fuel level gauges, where used, must be on the topmost surfaces of tanks. Tanks may not have any openings in bottoms, sides, or ends, except for:

(i) An opening fitted with a threaded plug or cap installed for tank cleaning purposes; and

(ii) In a diesel fuel tank, openings for supply piping and tubular gauge glasses.

(6) All tank joints must be welded or brazed. Lap joints may not be used.

(7) Nozzles, flanges, or other fittings for pipe connections to a metal tank must be welded or brazed to the tank. Tank openings in way of pipe connections must be properly reinforced where necessary. Where fuel level gauges are used on a metal tank, the flanges to which gauge fittings are attached must be welded or brazed to the tank. No tubular gauge glasses may be fitted to gasoline fuel tanks. Tubular gauge glasses, if fitted to diesel fuel tanks, must be of heat resistant materials, adequately protected from mechanical damage, and provided at the tank connections with devices that will automatically close in the event of rupture of the gauge or gauge lines.

(8) A metal tank exceeding 760 millimeters (30 inches) in any horizontal dimension must:

(i) Be fitted with vertical baffle plates, which meet subparagraph (a)(9) of this section, at intervals not exceeding 760 millimeters (30 inches) to provide strength and to control the excessive surge of fuel; or

(ii) The owner shall submit calculations to the cognizant OCMI demonstrating the structural adequacy of the tank in a fully loaded static condition and in a worst case dynamic (sloshing) condition.

(9) Baffle plates, where required in metal tanks, must be of the same material and not less than the minimum thickness required in the tank walls and must be connected to the tank walls by welding or brazing. Limber holes at the bottom and air holes at the top of all baffles must be provided.

(10) Iron or steel diesel fuel tanks must not be galvanized on the interior. Galvanizing, paint, or other suitable

coating must be used to protect the outside of iron and steel diesel fuel tanks and the inside and outside of iron and steel gasoline fuel tanks.

(b) *Location and installation.* Independent fuel tanks must be located and installed in compliance with the requirements of this paragraph.

(1) Fuel tanks must be located in, or as close as practicable to, machinery spaces.

(2) Fuel tanks and fittings must be so installed as to permit examination, testing, or removal for cleaning with minimum disturbance to the hull structure.

(3) Fuel tanks must be adequately supported and braced to prevent movement. The supports and braces must be insulated from contact with the tank surfaces with a nonabrasive and nonabsorbent material.

(4) All fuel tanks must be electrically bonded to a common ground.

(c) *Tests.* Independent fuel tanks must be tested in compliance with the requirements of this part prior to being used to carry fuel.

(1) Prior to installation, tanks vented to the atmosphere must be hydrostatically tested to, and must withstand, a pressure of 35 kPa (5 psig) or 1½ times the maximum pressure head to which they may be subjected in service, whichever is greater. A standpipe of 3.5 meters (11.5 feet) in height attached to the tank may be filled with water to accomplish the 35 kPa (5 psig) test. Permanent deformation of the tank will not be cause for rejection unless accompanied by leakage.

(2) After installation of the fuel tank on a vessel, the complete installation must be tested in the presence of a marine inspector, or individual specified by the cognizant OCMI, to a heat not less than that to which the tank may be subjected in service. Fuel may be used as the testing medium.

(3) All tanks not vented to the atmosphere must be constructed and tested in accordance with §182.330 of this part.

(d) *Alternative procedures.* A vessel of not more than 19.8 meters (65 feet) in length carrying not more than 12 passengers, with independent gasoline fuel tanks built in accordance with ABYC Project H–24, or 33 CFR 183, subpart J, or with independent diesel fuel tanks built in accordance with ABYC Project H–33, will be considered as meeting the requirements of this section. However, tanks must not be fabricated from any material not listed in Table 182.440(a)(1) without approval by the Commandant under paragraph (a)(3) of this section.

[CGD 85–080, 61 FR 986, Jan. 10, 1996, as amended by USCG–1999–5151, 64 FR 67186, Dec. 1, 1999]

§182.445 Fill and sounding pipes for fuel tanks.

(a) Fill pipes for fuel tanks must be not less than 40 millimeters (1.5 inches) nominal pipe size.

(b) There must be a means of accurately determining the amount of fuel in each fuel tank either by sounding, through a separate sounding pipe or a fill pipe, or by an installed marine type fuel gauge.

(c) Where sounding pipes are used, their openings must be at least as high as the opening of the fill pipe and they must be kept closed at all times except during sounding.

(d) Fill pipes and sounding pipes must be so arranged that overflow of liquid or vapor cannot escape to the inside of the vessel.

(e) Fill pipes and sounding pipes must run as directly as possible, preferably in a straight line, from the deck connection to the top of the tank. Such pipes must terminate on the weather deck and must be fitted with shutoff valves, watertight deck plates, or screw caps, suitably marked for identification. Gasoline fill pipes and sounding pipes must extend to within one-half of their diameter from the bottom of the tank. Diesel fill pipes and sounding pipes may terminate at the top of the tank.

(f) A vessel of not more than 19.8 meters (65 feet) carrying not more than 12 passengers, with a gasoline fuel system built in accordance with ABYC Project H–24, or 33 CFR 183, subpart J, or with a diesel fuel system built in accordance with ABYC Project H–33, will be considered as meeting the requirements of this section.

(g) Where a flexible fill pipe section is necessary, suitable flexible tubing or hose having high resistance to salt

water, petroleum oils, heat and vibration, may be used. Such hose must overlap metallic pipe ends at the least 1½ times the pipe diameter and must be secured at each end by clamps. The flexible section must be accessible and as near the upper end of the fill pipe as practicable. When the flexible section is a nonconductor of electricity, the metallic sections of the fill pipe separated thereby must be joined by a conductor for protection against generation of a static charge when filling with fuel.

§ 182.450 Vent pipes for fuel tanks.

(a) Each unpressurized fuel tank must be fitted with a vent pipe connected to the highest point of the tank.

(b) The net cross sectional area of the vent pipe for a gasoline fuel tank must not be less than that of 19 millimeters (0.75 inches) outer diameter (O.D.) tubing (0.9 millimeter (0.035 Inch) wall thickness, 20 gauge), except that, where the tank is filled under pressure, the net cross sectional area of the vent pipe must be not less than that of the fill pipe.

(c) The minimum net cross sectional area of the vent pipe for diesel fuel tanks must be as follows:

(1) Not less than the cross sectional area of 16 millimeters (0.625 inches) outer diameter (O.D.) tubing (0.9 millimeter (0.035-inch) wall thickness, 20 gauge), if the fill pipe terminates at the top of the tank;

(2) Not less than the cross sectional area of 19 millimeters (0.75 inches) O.D. tubing (0.9 millimeter (0.035-inch) wall thickness, 20 gauge), if the fill pipe extends into the tank; and

(3) Not less than the cross sectional area of the fill pipe if the tank is filled under pressure.

(d) The discharge ends of fuel tank vent pipes must terminate on the hull exterior as high above the waterline as practicable and remote from any hull openings, or they must terminate in U-bends as high above the weather deck as practicable and as far as practicable from openings into any enclosed spaces. Vent pipes terminating on the hull exterior must be installed or equipped to prevent the accidental contamination of the fuel by water under normal operating conditions.

(e) The discharge ends of fuel tank vent pipes must be fitted with removable flame screens or flame arresters. The flame screens must consist of a single screen of corrosion resistant wire of at least 30x30 mesh. The flame screens or flame arresters must be of such size and design as to prevent reduction in the net cross sectional area of the vent pipe and permit cleaning or renewal of the flame screens or arrester elements.

(f) A vessel of not more than 19.8 meters (65 feet) in length carrying not more than 12 passengers, with fuel gasoline tank vents built in accordance with ABYC Project H–24, or 33 CFR 183, subpart J, or with diesel fuel tank vents built in accordance with ABYC Project H–33, will be considered as meeting the requirements of this section.

(g) Where a flexible vent pipe section is necessary, suitable flexible tubing or hose having high resistance to salt water, petroleum oils, heat and vibration, may be used. Such hose must overlap metallic pipe ends at least 1½ times the pipe diameter and must be secured at each end by clamps. The flexible section must be accessible and as near the upper end of the vent pipe as practicable.

(h) Fuel tank vent pipes shall be installed to gradient upward to prevent fuel from being trapped in the line.

§ 182.455 Fuel piping.

(a) *Materials and workmanship.* The materials and construction of fuel lines, including pipe, tube, and hose, must comply with the requirements of this paragraph.

(1) Fuel lines must be annealed tubing of copper, nickel-copper, or copper-nickel having a minimum wall thickness of 9 millimeters (0.035 inch) except that:

(i) Diesel fuel piping of other materials, such as seamless steel pipe or tubing, which provide equivalent safety may be used;

(ii) Diesel fuel piping of aluminum is acceptable on aluminum hull vessels provided it is a minimum of Schedule 80 wall thickness; and

(iii) when used, flexible hose must meet the requirements of § 182.720(e) of this part.

(2) Tubing connections and fittings must be of nonferrous drawn or forged metal of the flared type except that flareless fittings of the non-bite type may be used when the tubing system is of nickel-copper or copper-nickel. When making tube connections, the tubing must be cut square and flared by suitable tools. Tube ends must be annealed before flaring.

(3) Cocks are prohibited except for the solid bottom type with tapered plugs and union bonnets.

(4) Valves for gasoline fuel must be of a suitable nonferrous type.

(b) *Installation.* The installation of fuel lines, including pipe, tube, and hose, must comply with the requirements of this paragraph.

(1) Gasoline fuel lines must be connected at the top of the fuel tank and run at or above the level of the tank top to a point as close to the engine connection as practicable, except that lines below the level of the tank top are permitted if equipped with anti-siphon protection.

(2) Diesel fuel lines may be connected to the fuel tank at or near the bottom of the tank.

(3) Fuel lines must be accessible, protected from mechanical injury, and effectively secured against excessive movement and vibration by the use of soft nonferrous metal straps which have no sharp edges and are insulated to protect against corrosion. Where passing through bulkheads, fuel lines must be protected by close fitting ferrules or stuffing boxes. All fuel lines and fittings must be accessible for inspection.

(4) Shutoff valves, installed so as to close against the fuel flow, must be fitted in the fuel supply lines, one at the tank connection and one at the engine end of the fuel line to stop fuel flow when servicing accessories. The shutoff valve at the tank must be manually operable from outside the compartment in which the valve is located, preferably from an accessible position on the weather deck. If the handle to the shutoff valve at the tank is located inside the machinery space, it must be located so that the operator does not have to reach more than 300 millimeters (12 inches) into the machinery space and the valve handle must be shielded from flames by the same material the hull is constructed of, or some noncombustible material. Electric solenoid valves must not be used, unless used in addition to the manual valve.

(5) A loop of copper tubing or a short length of flexible hose must be installed in the fuel supply line at or near the engines. The flexible hose must meet the requirements of §182.720(e).

(6) A suitable metal marine type strainer, meeting the requirements of the engine manufacturer, must be fitted in the fuel supply line in the engine compartment. Strainers must be leak free. Strainers must be the type of opening on top for cleaning screens. A drip pan fitted with flame screen must be installed under gasoline strainers. Fuel filter and strainer bowls must be highly resistant to shattering due to mechanical impact and resistant to failure due to thermal shock. Fuel filters fitted with bowls of other than steel construction must be approved by the Commandant and be protected from mechanical damage. Approval of bowls of other than steel construction will specify if a flame shield is required.

(7) All accessories installed in the fuel line must be independently supported.

(8) Outlets in gasoline fuel lines that would permit drawing fuel below deck, for any purpose, are prohibited.

(9) Valves for removing water or impurities from diesel fuel in water traps or stainers are permitted. These valves must be provided with caps or plugs to prevent fuel leakage.

(c) *Alternative procedures.* A vessel of not more than 19.8 meters (65 feet) carrying no more than 12 passengers, with machinery powered by gasoline and a fuel system built in accordance with ABYC Project H–24, or 33 CFR 183, subpart J, or with machinery powered by diesel fuel and a fuel system built in accordance with ABYC Project H–33, will be considered as meeting the requirements of this section.

[CGD 85–080, 61 FR 986, Jan. 10, 1996, as amended by USCG–2001–10224, 66 FR 48621, Sept. 21, 2001]

§ 182.458 Portable fuel systems.

(a) Portable fuel systems, including portable tanks and related fuel lines and accessories, are prohibited except where used for portable dewatering pumps or outboard motor installations.

(b) The design, construction and stowage of portable tanks and related fuel lines and accessories must meet the requirements of ABYC Project H–25, ''Portable Gasoline Fuel systems for Flammable Liquids,'' or other standard specified by the Commandant.

[CGD 85–080, 61 FR 986, Jan. 10, 1996, as amended by CGD 97–057, 62 FR 51050, Sept. 30, 1997; CGD 85–080, 62 FR 51358, Sept. 30, 1997]

§ 182.460 Ventilation of spaces containing machinery powered by, or fuel tanks for, gasoline.

(a) A space containing machinery powered by, or fuel tanks for, gasoline must have a ventilation system that complies with this section and consists of:

(1) For an enclosed space:

(i) At least two natural ventilation supply ducts located at one end of the space and that extend to the lowest part of the space or to the bilge on each side of the space; and

(ii) A mechanical exhaust system consisting of at least two ventilation exhaust ducts located at the end of the space opposite from where the supply ducts are fitted, which extend to the lowest part of the bilge of the space on each side of the space, and which are led to one or more powered exhaust blowers; and

(2) For a partially enclosed space, at least one ventilation duct installed in the forward part of the space and one ventilation duct installed in the after part of the space, or as otherwise required by the cognizant OCMI. Ducts for partially enclosed spaces must have cowls or scoops as required by paragraph (i) of this section.

(b) A mechanical exhaust system required by paragraph (a)(1)(ii) of this section must be such as to assure the air changes as noted in Table 182.460(b) depending upon the size of the space.

TABLE 182.460(b)

Size of space in cubic meters (feet)		Minutes per air change
Over	Not over	
0	14 (500)	2
14 (500)	28.50 (1000)	3
28.50 (1000)	43 (1500)	4
43 (1500)	.....	5

(c) An exhaust blower motor may not be installed in a duct, and if mounted in any space required to be ventilated by this section, must be located as high above the bilge as practicable. Blower blades must be nonsparking with reference to their housings.

(d) Where a fixed gas fire extinguishing system is installed in a space, all powered exhaust blowers for the space must automatically shut down upon release of the extinguishing agent.

(e) Exhaust blower switches must be located outside of any space required to be ventilated by this section, and must be of the type interlocked with the starting switch and the ignition switch so that the blowers are started before the engine starter motor circuit or the engine ignition is energized. A red warning sign at the switch must state that the blowers must be operated prior to starting the engines for the time sufficient to insure at least one complete change of air in the space served.

(f) The area of the ventilation ducts must be sufficient to limit the air velocity to a maximum of 10 meters per second (2,000 feet per minute). A duct may be of any shape, provided that in no case will one cross sectional dimension exceed twice the other.

(g) A duct must be so installed that ordinary collection of water in the bilge will not block vapor flow.

(h) A duct must be of rigid permanent construction, which does not allow any appreciable vapor flow except through normal openings, and made of the same material as the hull or of noncombustible material. The duct must lead as directly as possible from its intake opening to its terminus and be securely fastened and supported.

(i) A supply duct must be provided at its intake opening with a cowl or scoop having a free area not less than twice the required duct area. When the cowl or scoop is screened, the mouth area

must be increased to compensate for the area of the screen wire. A cowl or scoop must be kept open at all times except when the weather is such as to endanger the vessel if the openings are not temporarily closed.

(j) Dampers may not be fitted in a supply duct.

(k) A duct opening may not be located where the natural flow of air is unduly obstructed, adjacent to possible sources of vapor ignition, or where exhaust air may be taken into a supply duct.

(l) Provision must be made for closing all supply duct cowls or scoops and exhaust duct discharge openings for a space protected by a fixed gas extinguishing system. All closure devices must be readily available and mounted in the vicinity of the vent.

(m) A vessel of not more than 19.8 meters (65 feet) in length carrying not more than 12 passengers, with ventilation installations in accordance with ABYC Project H–2, ''Ventilation of Boats Using Gasoline,'' or 33 CFR 183, subpart K, ''Ventilation,'' will be considered as meeting the requirements of this section.

[CGD 85–080, 61 FR 986, Jan. 10, 1996, as amended by CGD 97–057, 62 FR 51050, Sept. 30, 1997]

§ 182.465 Ventilation of spaces containing diesel machinery.

(a) A space containing diesel machinery must be fitted with adequate means such as dripproof ventilators, ducts, or louvers, to provide sufficient air for proper operation of main engines and auxiliary engines.

(b) Air-cooled propulsion and auxiliary diesel engines installed below deck, as permitted by §182.420, must be fitted with air supply ducts or piping from the weather deck. The ducts or piping must be so arranged and supported to be capable of safely sustaining stresses induced by weight and engine vibration and to minimize transfer of vibration to the supporting structure. Prior to installation of ventilation system for such engines, plans or sketches showing machinery arrangement including air supplies, exhaust stack, method of attachment of ventilation ducts to the engine, location of spark arresting mufflers and capacity of ventilation blowers must be submitted to the cognizant OCMI for approval.

(c) A space containing diesel machinery must be fitted with at least two ducts to furnish natural or powered supply and exhaust ventilation. The total inlet area and the total outlet area of each ventilation duct may not be less than one square inch for each foot of beam of the vessel. These minimum areas must be increased as necessary when the ducts are considered as part of the air supply to the engines.

(d) A duct must be of rigid permanent construction, which does not allow any appreciable vapor flow except through normal openings, and made of the same material as the hull or of noncombustible material. The duct must lead as directly as possible from its intake opening to its terminus and be securely fastened and supported.

(e) A supply duct must be provided with a cowl or scoop having a free area not less than twice the required duct area. When the cowl or scoop is screened, the mouth area must be increased to compensate for the area of the screen wire. A cowl or scoop must be kept open at all times except when the weather is such as to endanger the vessel if the openings are not temporarily closed.

(f) Dampers may not be fitted in a supply duct.

(g) A duct opening may not be located where the natural flow of air is unduly obstructed, adjacent to possible sources of vapor ignition, or where exhaust air may be taken into a supply duct.

(h) provision must be made for closing all supply duct cowls or scoops and exhaust duct discharge openings for a space protected by a fixed gas extinguishing system. All closure devices must be readily available and mounted in the vicinity of the vent.

(i) A vessel of not more than 19.8 meters (65 feet) in length carrying not more than 12 passengers, with ventilation installations in accordance with ABYC Project H–32, ''Ventilation of Boats Using Diesel Fuel,'' will be considered as meeting the requirements of this section.

§ 182.470 Ventilation of spaces containing diesel fuel tanks.

(a) Unless provided with ventilation that complies with § 182.465, a space containing a diesel fuel tank and no machinery must meet the requirements of this section.

(1) A space of 14 cubic meters (500 cubic feet) or more in volume must have a gooseneck vent of not less than 65 millimeters (2.5 inches) in diameter.

(2) A space of less than 14 cubic meters (500 cubic feet) in volume must have a gooseneck vent of not less than 40 millimeters (1.5 inches) in diameter.

(b) Vent openings may not be located adjacent to possible sources of vapor ignition.

(c) A vessel of not more than 19.8 meters (65 feet) in length carrying not more than 12 passengers, with ventilation installations in accordance with ABYC Project H–32, ''Ventilation of Boats Using Diesel Fuel,'' will be considered as meeting the requirements of this section.

§ 182.480 Flammable vapor detection systems.

(a) A flammable vapor detection system required by § 182.410(c) must meet UL Standard 1110, ''Marine Combustible Gas Indicators,'' or be approved by an independent laboratory.

(b) Procedures for checking the proper operation of a flammable vapor detection system must be posted at the primary operating station. The system must be self-monitoring and include a ground fault indication alarm.

(c) A flammable vapor detection system must be operational for 30 seconds prior to engine startup and continue sensing the entire time the engine is running.

(d) A flammable vapor detection system must provide a visual and audible alarm at the operating station.

(e) A sensor must be located above the expected bilge water level in the following locations:

(1) The lowest part of a machinery space;

(2) The lowest part of a space containing a fuel tank when separate from the machinery space; and

(3) Any other location when required by the cognizant OCMI.

(f) A flammable vapor detection system must be installed so as to permit calibration in a vapor free atmosphere.

(g) Electrical connections, wiring, and components for a flammable vapor detection system must comply with part 183 of this chapter.

(h) An operation and maintenance manual for the flammable vapor detection system must be kept onboard.

Subpart E—Bilge and Ballast Systems

§ 182.500 General.

(a) A vessel must be provided with a satisfactory arrangement for draining any watertight compartment, other than small buoyancy compartments, under all practicable conditions. Sluice valves are not permitted in watertight bulkheads.

(b) A vessel of not more than 19.8 meters (65 feet) in length carrying not more than 12 passengers may meet the requirements of ABYC Project H–22, ''DC Electric Bilge Pumps Operating Under 50 Volts,'' in lieu of the requirements of this subpart, provided that each watertight compartment, other than small buoyancy compartments and the compartment forward of the collision bulkhead, is provided with a means for dewatering.

(c) Special consideration may be given to vessels, such as high speed craft, which have a high degree of subdivision and utilize numerous small buoyancy compartments. Where the probability of flooding of the space is limited to external hull damage, compartment drainage may be omitted provided it can be shown by stability calculations, submitted to the cognizant OCMI, that the safety of the vessel will not be impaired.

§ 182.510 Bilge piping system.

(a) A vessel of at least 7.9 meters (26 feet) in length must be provided with individual bilge lines and bilge suctions for each watertight compartment, except that the space forward of the collision bulkhead need not be fitted with a bilge suction line when the arrangement of the vessel is such that ordinary leakage may be removed from this compartment by the use of a hand portable bilge pump or other

equipment, and such equipment is provided.

(b) A bilge pipe in a vessel of not more than 19.8 meters (65 feet) in length must be not less than 25 millimeters (1 inch) nominal pipe size. A bilge pipe in a vessel of more than 19.8 meters (65 feet) in length must be not less than 40 millimeters (1.5 inches) nominal pipe size. A bilge suction must be fitted with a suitable strainer having an open area not less than three times the area of the bilge pipe.

(c) Except when individual pumps are provided for separate spaces, individual bilge suction lines must be led to a central control point or manifold and provided with a stop valve at the control point or manifold and a check valve at some accessible point in the bilge line. A stop-check valve located at a control point or manifold will meet the requirements for both a stop valve and a check valve.

(d) A bilge pipe piercing the collision bulkhead must be fitted with a screw-down valve located on the forward side of the collision bulkhead and operable from the weather deck, or, if it is readily accessible under service conditions, a screw-down valve without a reach rod may be fitted to the bilge line on the after side of the collision bulkhead.

§ 182.520 Bilge pumps.

(a) A vessel must be provided with bilge pumps in accordance with Table 182.520(a). A second power pump is an acceptable alternative to a hand pump if it is supplied by a source of power independent of the first power bilge pump. Individual power pumps used for separate spaces are to be controlled from a central control point and must have a light or other visual means at the control point to indicate operation.

TABLE 182.520(a)

Number of passengers	Length of vessel	Bilge pumps required	Min. capacity required per pump ltrs/min (gal/min)
Any number	More than 19.8 m (65 ft)	2 fixed power pumps	190 LPM (50 GPM).
More than 49 passengers and all ferry vessels.	Not more than 19.8 m (65 ft).	1 fixed power pump and	95 LPM (25 GPM).
		1 portable hand pump	38 LPM (10 GPM).
Not more than 49 passengers (Other than ferry vessels).	7.9 m, 26 feet up to 19.8 m (65 ft).	1 fixed power pump and 1 portable hand pump or.	38 LPM (10 GPM).
		1 fixed hand pump and	38 LPM (10 GPM).
		1 portable hand pump	19 LPM (5 GPM).
	Less than 7.9 m (26 ft)	1 portable hand pump	19 LPM (5 GPM).

(b) A portable hand bilge pump must be:

(1) Capable of pumping water, but not necessarily simultaneously, from all watertight compartments; and

(2) Provided with suitable suction hose capable of reaching the bilge of each watertight compartment and discharging overboard.

(c) Each fixed power bilge pump must be self priming. It may be driven off the main engine or other source of power. It must be permanently connected to the bilge manifold and may also be connected to the fire main. If of sufficient capacity, a power bilge pump may also serve as a fire pump.

(d) Where two fixed power bilge pumps are installed, they must be driven by different sources of power. If one pump is driven off the main engine in a single propulsion engine installation, the other must be independently driven. In a twin propulsion engine installation, each pump may be driven off a different propulsion engine.

(e) A submersible electric bilge pump may be used as a power bilge pump required by Table 182.520(a) only on a vessel of not more than 19.8 meters (65 feet) in length carrying not more than 49 passengers, other than a ferry, provided that:

(1) The pump is listed by Underwriters' Laboratories Inc. or another independent laboratory;

(2) The pump is used to dewater not more than one watertight compartment;

(3) The pump is permanently mounted;

(4) The pump is equipped with a strainer that can be readily inspected and cleaned without removal;

(5) The pump discharge line is suitably supported;

(6) The opening in the hull for the pump discharge is placed as high above the waterline as possible;

(7) A positive shutoff valve is installed at the hull penetration; and

(8) The capacity of the electrical system, including wiring, and size and number of batteries, is designed to allow all bilge pumps to be operated simultaneously.

(f) A flexible tube or hose may be used instead of fixed pipe for the discharge line of a submersible electric bilge pump provided the hose or tube does not penetrate any required watertight bulkheads and is:

(1) Of good quality and of substantial construction, suitable for the intended use; and

(2) Highly resistant to salt water, petroleum oil, heat, and vibration.

(g) If a fixed hand pump is used to comply with Table 182.520(a), it must be permanently connected to the bilge system.

(h) On a vessel of not more than 19.8 meters (65 feet) in length, a power driven fire pump required by §181.300 of this chapter may serve as a fixed power bilge pump required by this subpart, provided it has the minimum flow rate required by Table 182.520(a).

(i) On a vessel of more than 19.8 meters (65 feet) in length, a power driven fire pump required by §181.300 of this subchapter may serve as one of the two fixed power bilge pumps required by this subpart, provided:

(1) The bilge and fire pump systems are interconnected;

(2) The dedicated bilge pump is capable of pumping the bilges at the same time the fire/bilge pump charges the firemain; and

(3) Stop valves and check valves are installed in the piping to isolate the systems during simultaneous operation and prevent possible flooding through the bilge system.

(j) A catamaran vessel must be equipped with bilge pumps for each hull, as if each hull is a separate vessel, in accordance with Table 182.520(a), except where:

(1) One dedicated pump is located in each hull;

(2) Each dedicated pump is driven by an independent source of power; and

(3) The bilge system is permanently cross connected between hulls.

[CGD 85–080, 61 FR 986, Jan. 10, 1996; 61 FR 20557, May 7, 1996, as amended by CGD 97–057, 62 FR 51050, Sept. 30, 1997; CGD 85–080, 62 FR 51358, Sept. 30, 1997]

§ 182.530 Bilge high level alarms.

(a) On a vessel of at least 7.9 meters (26 feet) in length, a visual and audible alarm must be provided at the operating station to indicate a high water level in each of the following normally unmanned spaces:

(1) A space with a through-hull fitting below the deepest load waterline, such as a lazarette;

(2) A machinery space bilge, bilge well, shaft alley bilge, or other spaces subject to flooding from sea water piping within the space; and

(3) A space with a non-watertight closure, such as a space with a non-watertight hatch on the main deck.

(b) Vessels constructed of wood must, in addition to paragraph (a), provide bilge level alarms in all watertight compartments except small buoyancy chambers.

(c) A visual indicator must be provided at the operating station to indicate when any automatic bilge pump is operating.

§ 182.540 Ballast systems.

(a) Ballast piping must not be installed in any compartment integral with the hull of a wooden vessel. Where the carriage of liquid ballast in such a vessel is necessary, suitable ballast tanks, structurally independent of the hull, must be provided.

(b) Solid and water ballast must comply with the requirements of part 178 of this subchapter.

Subpart F—Steering Systems

§ 182.600 General.

A self-propelled vessel must comply with the provisions of this subpart.

§ 182.610 Main steering gear.

(a) A vessel must be provided with a main steering gear that is:

(1) Of adequate strength and capable of steering the vessel at all service speeds;

(2) Designed to operate at maximum astern speed without being damaged or jammed; and

(3) Capable of moving the rudder from 35 degrees on one side to 30 degrees on the other side in not more than 28 seconds with the vessel moving ahead at maximum service speed.

(b) Control of the main steering gear, including control of any necessary associated devices (motor, pump, valve, etc.), must be provided from the operating station.

(c) The main steering gear must be designed so that transfer from the main steering gear or control to the auxiliary means of steering required by §182.620 can be achieved rapidly. Any tools or equipment necessary to make the transfer must be readily available.

(d) The operating station must be arranged to permit the person steering to have the best possible all around vision.

(e) Strong and effective rudder stops must be provided to prevent jamming and damage to the rudder and its fittings. These stops may be structural or internal to the main steering gear.

(f) In addition to meeting the requirements of paragraphs (a) through (e) of this section, a vessel with a power driven main steering gear must be provided with the following:

(1) A disconnect switch located in the steering compartment, and instantaneous short circuit protection for electrical power and control circuits sized and located in accordance with §58.25–55(d) of this chapter. Overload protection is prohibited;

(2) An independent rudder angle indicator at the operating station;

(3) An arrangement that automatically resumes operation, without reset, when power is restored after a power failure;

(4) A manual means to center and steady the rudder(s) in an emergency; and

(5) A limit switch to stop the steering gear before its reaches the rudder stops required by paragraph (e) of this section.

(g) In addition to meeting the requirements of paragraphs (a) through (f) of this section, a vessel more than 19.8 meters (65 feet) in length with a power driven main steering gear must be provided with the following:

(1) A visual means, located at the operating station, to indicate operation of the power units; and

(2) Instructions for transfer procedures from the main steering gear or control to the auxiliary means of steering required by §182.620, posted at the location where the transfer is carried out.

[CGD 85–080, 61 FR 986, Jan. 10, 1996, as amended at 62 FR 51358, Sept. 30, 1997]

§ 182.620 Auxiliary means of steering.

(a) Except as provided in paragraph (c) of this section, a vessel must be provided with an auxiliary means of steering that is:

(1) Of adequate strength;

(2) Capable of moving the rudder from 15 degrees on one side to 15 degrees on the other side in not more than 60 seconds with the vessel at one-half its maximum service speed ahead, or 7 knots, whichever is greater; and

(3) Controlled from a location that permits safe maneuvering of the vessel and does not expose the person operating the auxiliary means of steering to personnel hazards during normal or heavy weather operation.

(b) A suitable hand tiller may be acceptable as the auxiliary means of steering where satisfactory to the cognizant OCMI.

(c) An auxiliary means of steering need not be provided if:

(1) The main steering gear and its controls are provided in duplicate;

(2) Multiple screw propulsion, with independent pilothouse control for each screw, is provided, and the vessel is capable of being steered using pilothouse control;

(3) No regular rudder is fitted and steering action is obtained by a change of setting of the propelling unit; or

(4) Where a rudder and hand tiller are the main steering gear.

[CGD 85–080, 61 FR 986, Jan. 10, 1996, as amended by CGD 97–057, 62 FR 51050, Sept. 30, 1997]

Subpart G—Piping Systems

§ 182.700 General.

Materials used in piping systems must meet the requirements of this subpart and be otherwise acceptable to the cognizant OCMI.

§ 182.710 Piping for vital systems.

(a) Vital systems are those systems that are vital to a vessel's survivability and safety. For the purpose of this part the following are vital systems:

(1) Fuel system;

(2) Fire main;

(3) CO_2 and Halon systems;

(4) Bilge system;

(5) Steering system;

(6) Propulsion system and its necessary auxiliaries and controls;

(7) Ship's service and emergency electrical generation system and its necessary auxiliaries; and

(8) A marine engineering system identified by the cognizant OCMI as being crucial to the survival of the vessel or to the protection of the personnel on board.

(b) For the purpose of this part, a system not identified in paragraph (a) of this section is a non-vital system.

(c) Piping used in a vital system must:

(1) Be composed of ferrous materials except when:

(i) Nonmetallic piping materials are permitted by § 182.720; or

(ii) Nonferrous metallic piping materials are permitted by § 182.730; and

(2) If subject to a pressure of more than 1,034 kPa (150 psig), be designed, fabricated, and inspected in accordance with the principles of American National Standards Institute (ANSI) B 31.1, ''Code for Pressure Piping, Power Piping,'' or other standard specified by the Commandant.

§ 182.715 Piping subject to more than 1,034 kPa (150 psig) in non-vital systems.

Piping subject to more than 1,034 kPa (150 psig) in a non-vital system must be designed, fabricated, and inspected in accordance with the principles of ANSI B 31.1, or other industry standard acceptable to the Commandant.

§ 182.720 Nonmetallic piping materials.

(a) Rigid nonmetallic materials (plastic) may be used only in non-vital systems and in accordance with paragraphs (c) and (d) of this section.

(b) Flexible nonmetallic materials (hose) may be used in vital and non-vital systems where permitted by paragraph (e) of this section.

(c) Nonmetallic piping must not be used in gasoline or diesel fuel systems. Flexible nonmetallic materials (hose) may be used where permitted by paragraph (e) of this section.

(d) Where rigid nonmetallic material (plastic) is permitted for use in piping systems by this section, the following restrictions apply:

(1) Penetrations of required watertight decks and bulkheads by any rigid plastic pipe are prohibited unless the following requirements are met:

(i) Each penetration must be accomplished using an acceptable metallic through deck or through bulkhead fitting that is welded or otherwise attached to the bulkhead or deck by an accepted method; and

(ii) One or more metallic shutoff valves must be installed adjacent to the fitting in one of the following ways:

(A) Only one metallic shutoff valve must be installed if it is operable from above the bulkhead deck;

(B) If two metallic shutoff valves are installed, one on either side of the bulkhead, they need not be operable from above the bulkhead deck provided immediate access to both is possible; or

(C) Where both plastic and metallic materials are used in piping that penetrates a bulkhead, and the two materials exist entirely on opposite sides of the bulkhead, a metallic shutoff valve must be installed at the bulkhead in the metallic part of the system, with the valve being capable of operation from above the bulkhead deck, or locally if immediate access is possible;

(2) Protection from mechanical damage must be specifically considered and all protective covering or shields must be installed to the satisfaction of the cognizant OCMI;

(3) Through hull fittings and shutoff valves must be metallic. In the case of nonmetallic hulls, materials that will

afford an equal degree of safety and heat resistivity as that afforded by the hull may be approved; and

(4) The material specification must show that the rigid nonmetallic material possesses characteristics adequate for its intended service and environment and must be approved for use by the cognizant OCMI.

(e) Where flexible nonmetallic hose is permitted for use in piping systems by this section, it must meet SAE Standard J–1942, ''Hose and Hose Assemblies for Marine Applications,'' or be specifically approved by the Commandant. The following restrictions apply:

(1) Flexible nonmetallic hose must be complete with factory-assembled end fittings requiring no further adjustment of the fittings on the hose, or field attachable type fittings may be used. Hose end fittings must comply with SAE J–1475, ''Hydraulic Hose Fittings For Marine Applications.''Field attachable fittings must be installed following the manufacturer's recommended practice. If special equipment is required, such as crimping machines, it must be of the type and design specified by the manufacturer. If field attachable type fittings are used, each hose assembly must be individually hydrostatically tested to twice the maximum operating pressure of the system;

(2) Flexible nonmetallic hose may be used in non-vital water and pneumatic systems, subject to the limitations of paragraph (d)(1) through (d)(4) of this section. Unreinforced hoses are limited to a maximum service pressure of 349 kPa (50 psig), reinforced hoses are limited to a maximum service pressure of 1,034 kPa (150 psig); and

(3) Flexible nonmetallic hose may be used in lube oil, fuel oil and fluid power systems, subject to the following requirements:

(i) Flexible hose may only be used at a pressure not to exceed the manufacturer's rating and must have a high resistance to saltwater, petroleum oils, and vibration;

(ii) Flexible hose runs must be visible, easily accessible, protected from mechanical damage, and must not penetrate watertight decks or bulkheads;

(iii) Flexible hose must be fabricated with an inner tube and a cover of synthetic rubber or other suitable material reinforced with wire braid;

(iv) Flexible hose used for alcohol-gasoline blend fuels must meet the permeability requirements specified in 33 CFR part 183, subpart J; and

(v) For the purpose of flexibility only, flexible hose installed in lengths of not more than 760 millimeters (30 inches) and subject to pressures of not more than 35 kPa (5 psig), may meet the following requirements:

(A) Suitable compression type connection fittings may be accepted;

(B) Flexible hose designed for use with hose clamps may be installed with two clamps, at both ends of the hose, which:

(*1*) Do not rely on the spring tension of the clamp for compressive force; and

(*2*) Are installed beyond the bead or flare or over the serrations of the mating spud, pipe, or hose fitting; and

(C) USCG Type A1, A2, B1, or B2 flexible hose may be accepted in accordance with 33 CFR part 183, subpart J.

[CGD 85–080, 61 FR 986, Jan. 10, 1996, as amended at 62 FR 51358, Sept. 30, 1997]

§ 182.730 Nonferrous metallic piping materials.

(a) Nonferrous metallic piping materials are acceptable for use in the following:

(1) Non-vital systems;

(2) Aluminum fuel piping, if of a minimum of Schedule 80 wall thickness on an aluminum hulled vessel;

(3) Aluminum bilge, ballast, and firemain piping on an aluminum hulled vessel;

(4) If acceptable to the cognizant OCMI, nonferrous metallic piping with a melting temperature above 927° C (1,700° F) may be used in vital systems that are deemed to be galvanically compatible; and

(5) Other uses specifically accepted by the cognizant OCMI.

(b) Where nonferrous metallic material is permitted for use in piping systems by this subpart, the restrictions in this paragraph apply:

(1) Provisions must be made to protect piping systems using aluminum alloys in high risk fire areas due to the low melting point of aluminum alloys;

(2) Provisions must be made to prevent or mitigate the effect of galvanic corrosion due to the relative solution potentials of copper, aluminum, and alloys of copper and aluminum, which are used in conjunction with each other, steel, or other metals and their alloys;

(3) A suitable thread compound must be used in making up threaded joints in aluminum pipe to prevent seizing. Pipe in the annealed temper must not be threaded;

(4) The use of aluminum alloys with a copper content exceeding 0.6 percent is prohibited; and

(5) The use of cast aluminum alloys in hydraulic fluid power systems must be in accordance with the requirements of §58.30–15(f) in subchapter F of this chapter.

PART 183—ELECTRICAL INSTALLATION

Subpart A—General Provisions

Subpart B—General Requirements

Subpart C—Power Sources and Distribution Systems

Subpart D—Lighting Systems

Subpart E—Miscellaneous Systems and Requirements

AUTHORITY: 46 U.S.C. 2103, 3306; E.O. 12234, 45 FR 58801, 3 CFR, 1980 Comp., p. 277; 49 CFR 1.46.

SOURCE: CGD 85–080, 61 FR 997, Jan. 10, 1996, unless otherwise noted.

Subpart A—General Provisions

§ 183.100 Intent.

This part contains requirements for the design, construction, installation, and operation of electrical equipment and systems including power sources, lighting, motors, miscellaneous equipment, and safety systems.

§ 183.115 Applicability to existing vessels.

(a) Except as otherwise required by paragraphs (b) and (c) of this section, an existing vessel must comply with the regulations on electrical installations, equipment, and material that were applicable to the vessel on March 10, 1996, or, as an alternative, the vessel may comply with the regulations in this part.

(b) An existing vessel must comply with the requirements of §§183.420 and 183.430.

(c) New installations of electrical equipment and material, and the repair or replacement of wire and cable, on an existing vessel, which are completed to the satisfaction of the cognizant Officer in Charge, Marine Inspection (OCMI) on or after March 11, 1996, must comply with this part. Replacement of existing equipment, not including wire or cable, installed on the vessel prior to March 11, 1996 need not comply with the regulations in this part.

§ 183.130 Alternative standards.

(a) A vessel, other than a high speed craft, of not more than 19.8 meters (65